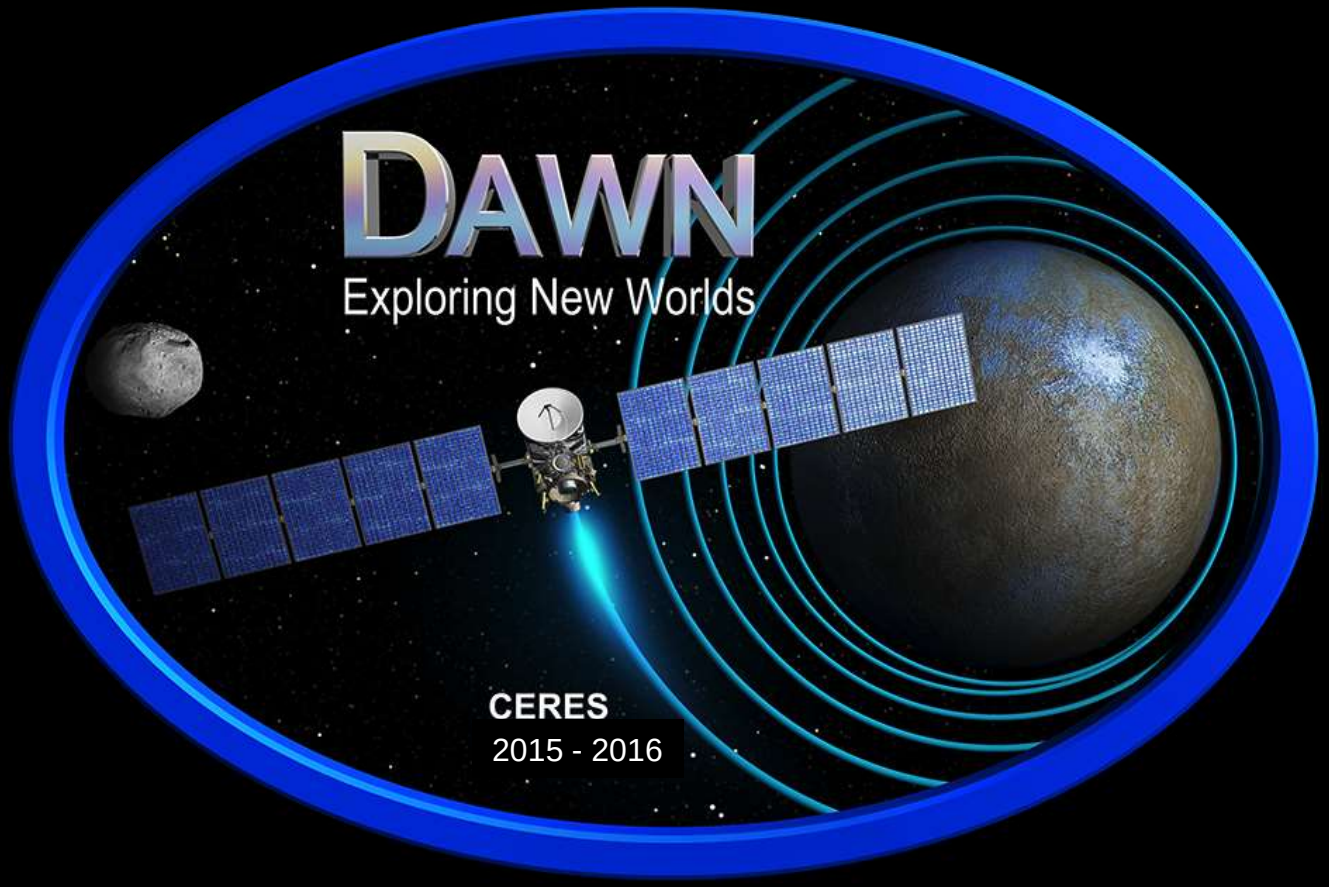

Jet Propulsion Laboratory
California Institute of Technology
DAWN
Exploring New Worlds



NASA

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Orbital ATK

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THE MAIN ASTEROID BELT

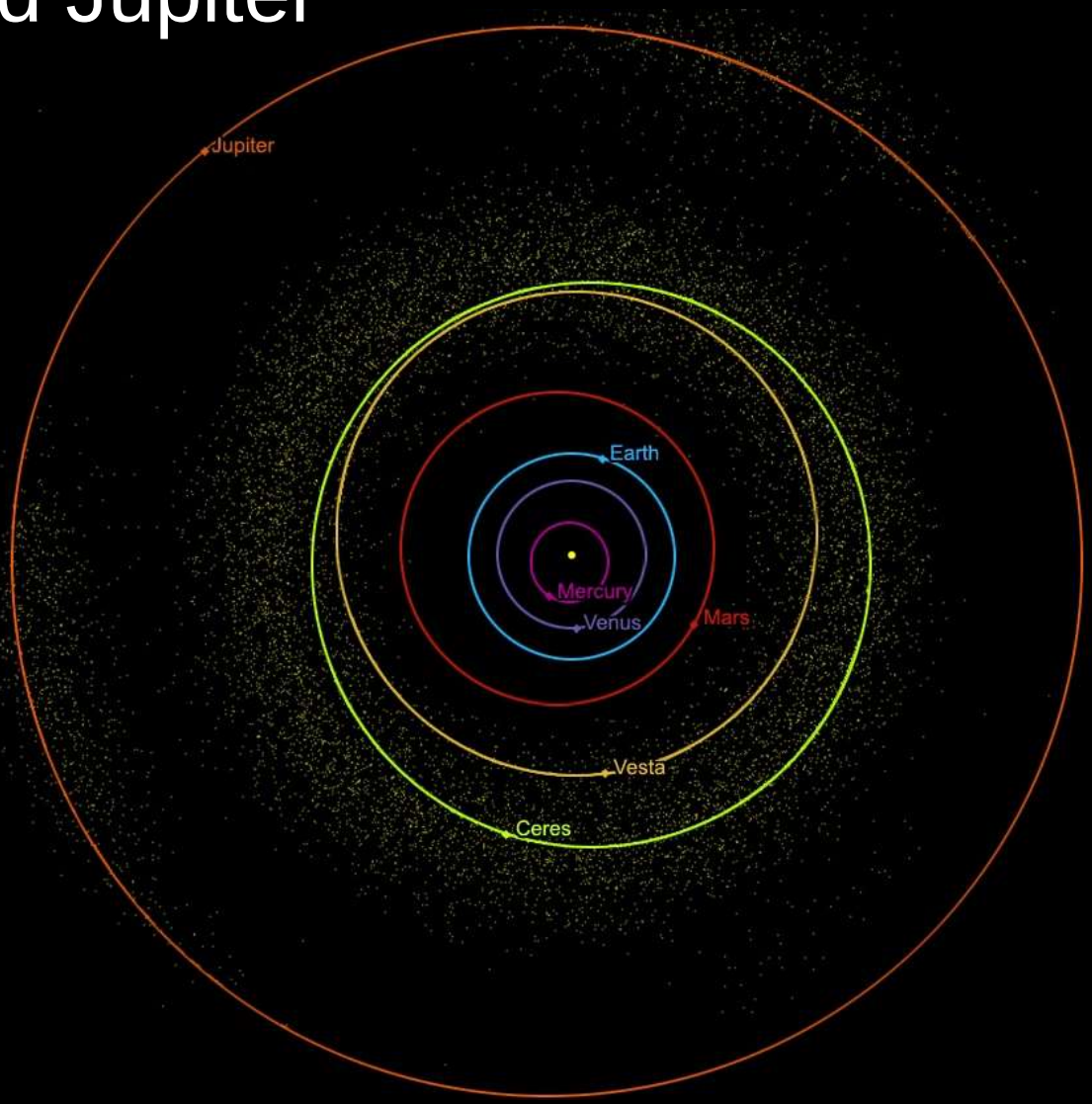
Ceres and Vesta

Dawn Probes Deep into the Heart of the Main Asteroid Belt to Discover Secrets of the Early Solar System

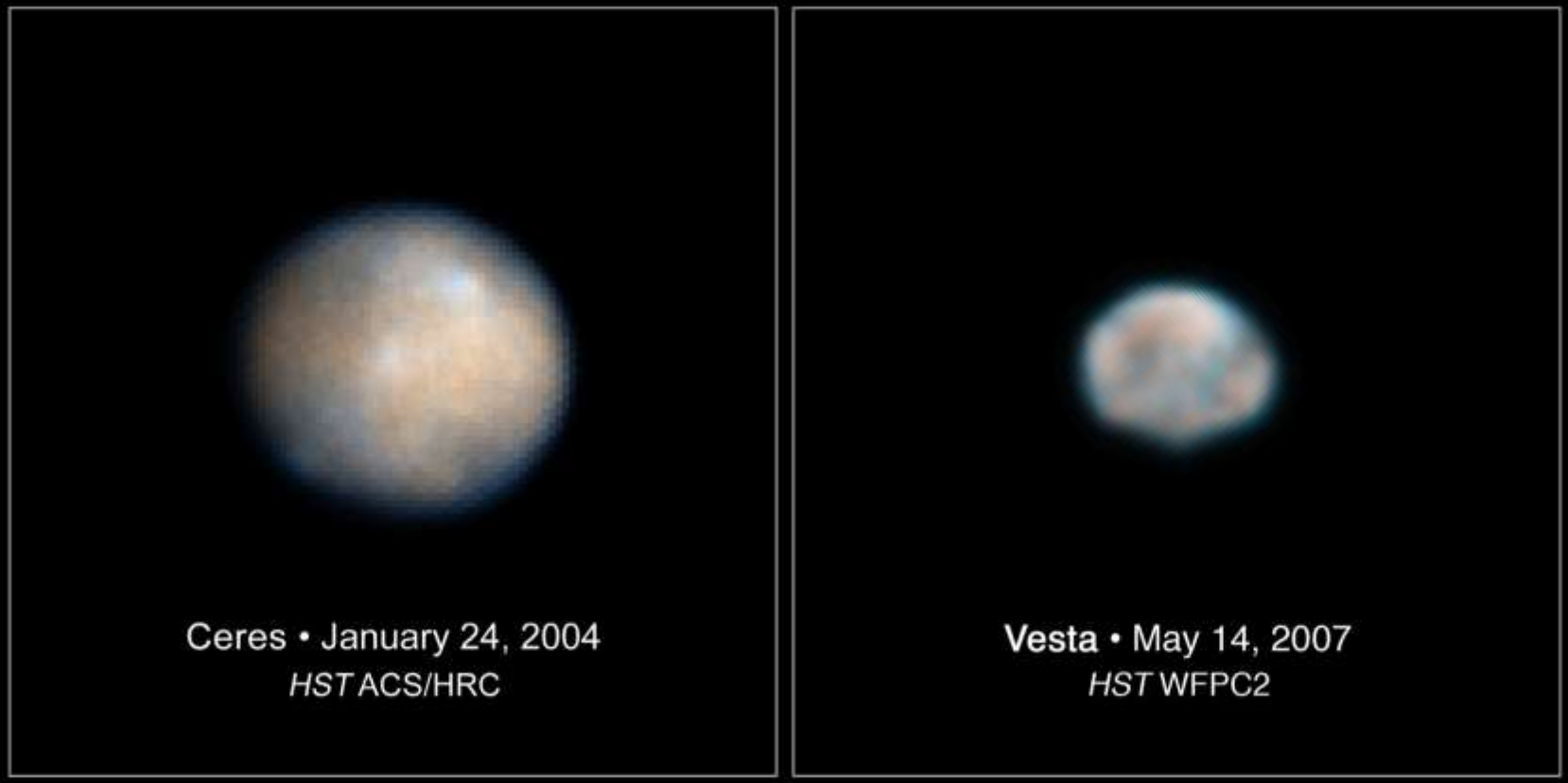
The Main Asteroid Belt

Between Mars and Jupiter

Ceres and Vesta represent the original building blocks of the terrestrial planets, preserved as fossils from the dawn of the solar system



Ceres and Vesta are the Most Massive Residents of the Main Belt

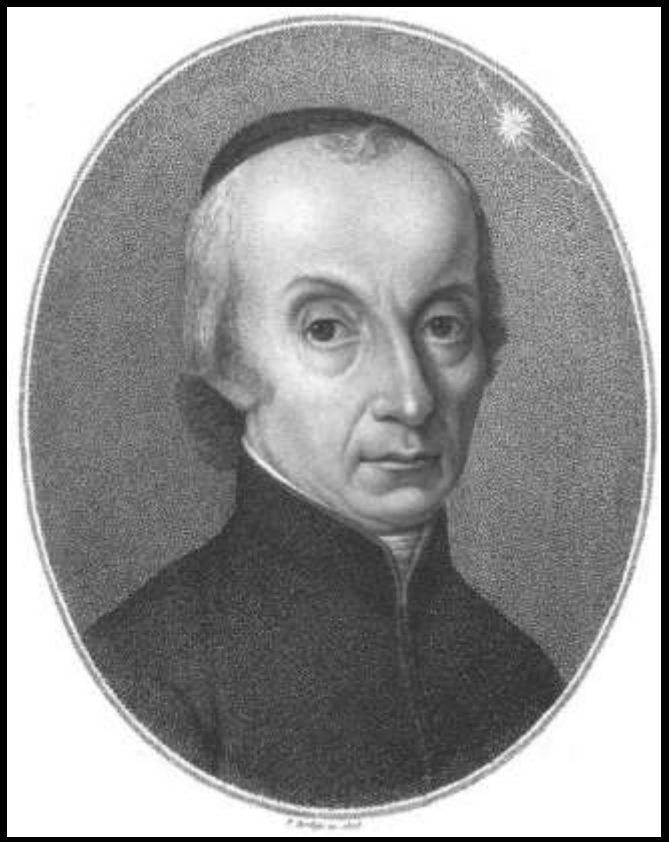


NASA, ESA, J. Parker (Southwest Research Institute), and L. McFadden (University of Maryland)
STScI-PRC07-27a

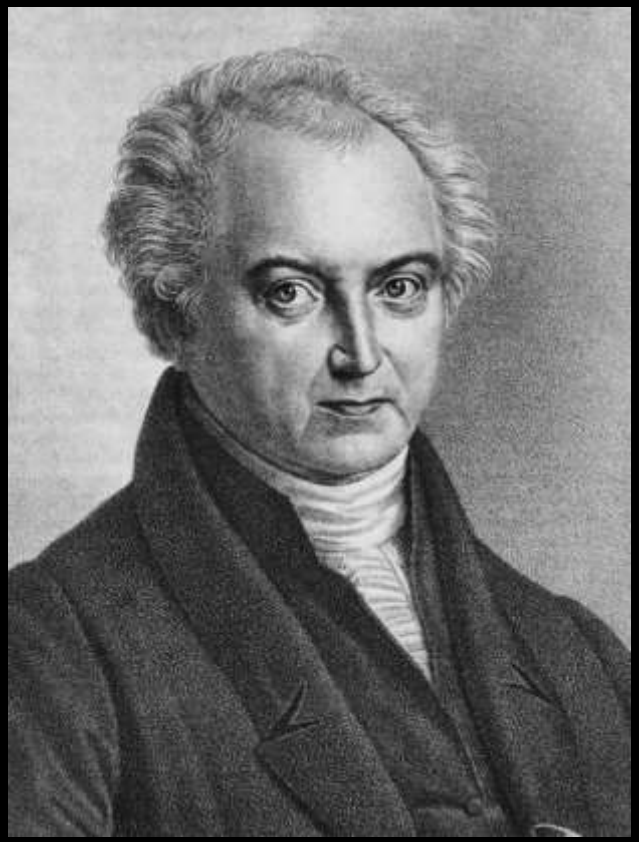
Best images prior to Dawn are from Hubble Space Telescope

We Have Known About Them for Two Centuries

Giuseppe Piazzi discovered Ceres in 1801



Heinrich Olbers discovered Vesta in 1807



They were first called planets, and later, asteroids

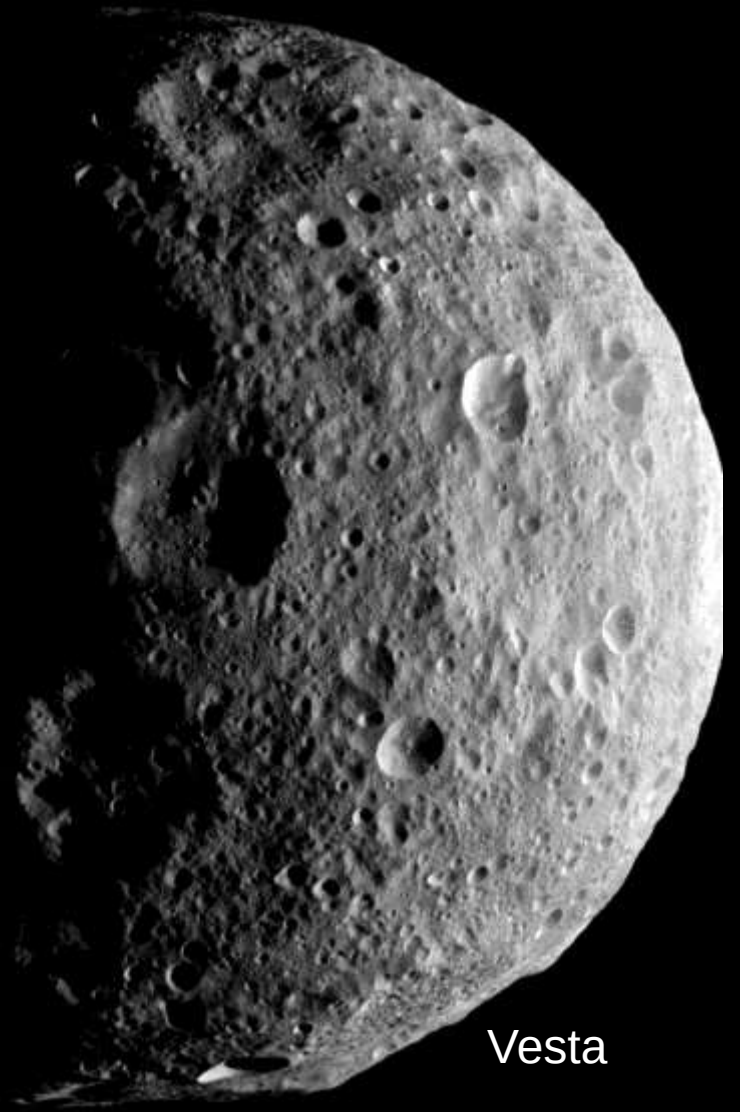
What Are They Made Of?

Vesta

- Is rocky, dry, and bright
- Has an iron core, mantle and crust made of basalt

Ceres

- Is icy, wet, and dark
- Is expected to have a rocky core, an ice mantle, and dusty surface

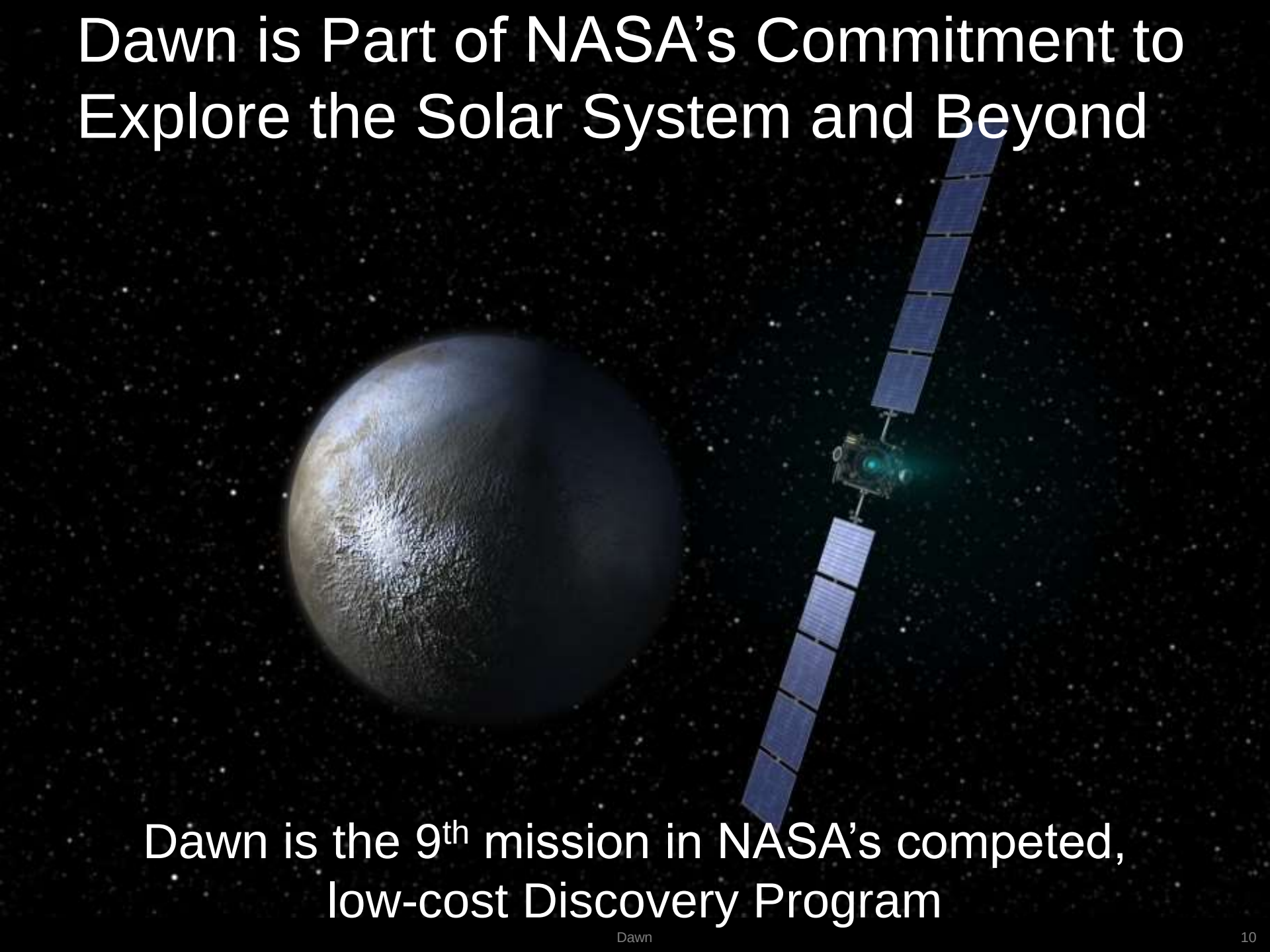


Vesta

Dawn

A Journey to the Beginning of the Solar System

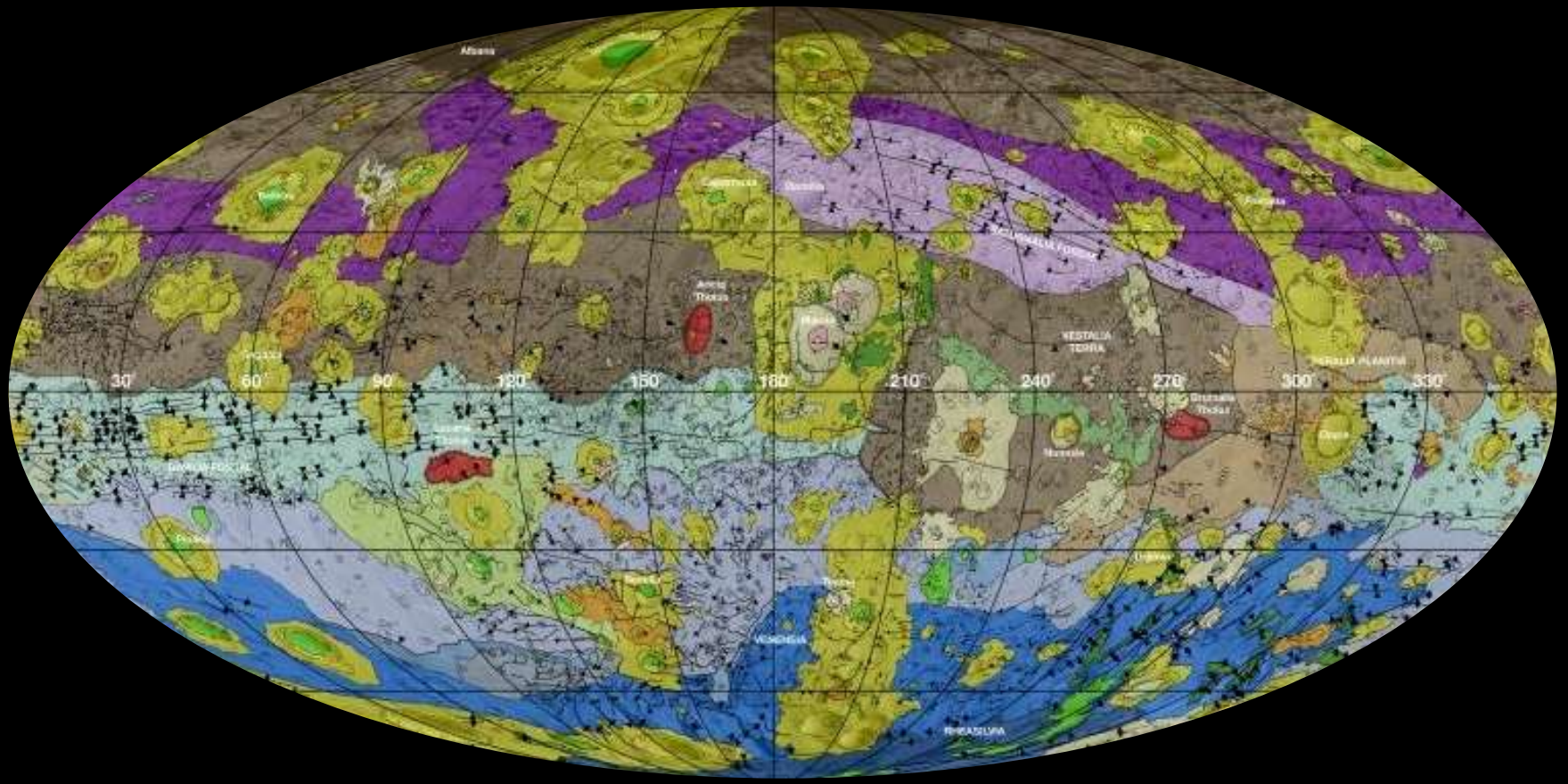
Dawn is Part of NASA's Commitment to Explore the Solar System and Beyond



Dawn is the 9th mission in NASA's competed, low-cost Discovery Program

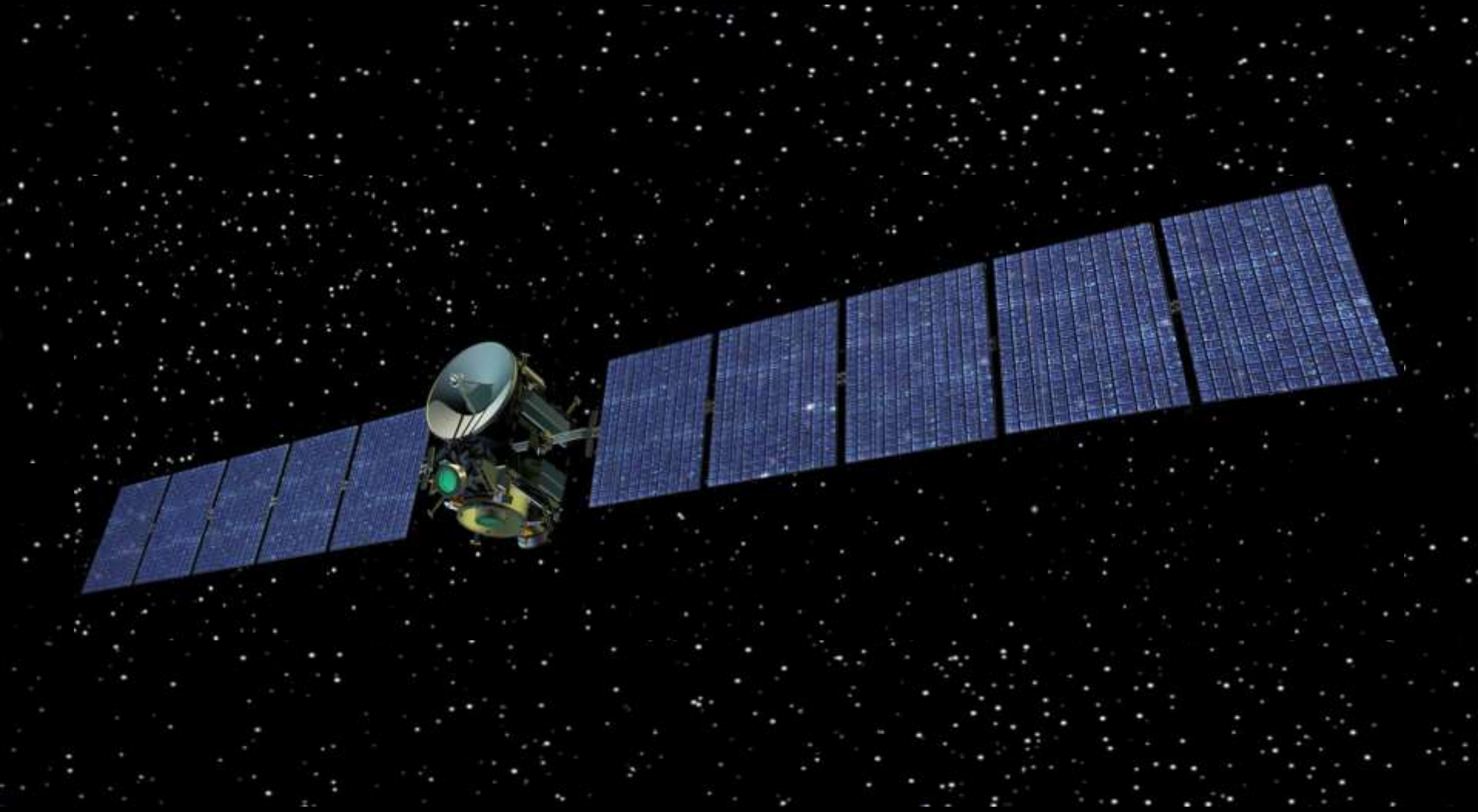
Dawn's Mission is to Understand Ceres and Vesta, and Discover What They Can Tell Us about How the Terrestrial Planets Formed

Dawn's Observation Campaign



Dawn orbits each body, mapping the surface composition and topography, as well as the gravity

Dawn Spacecraft

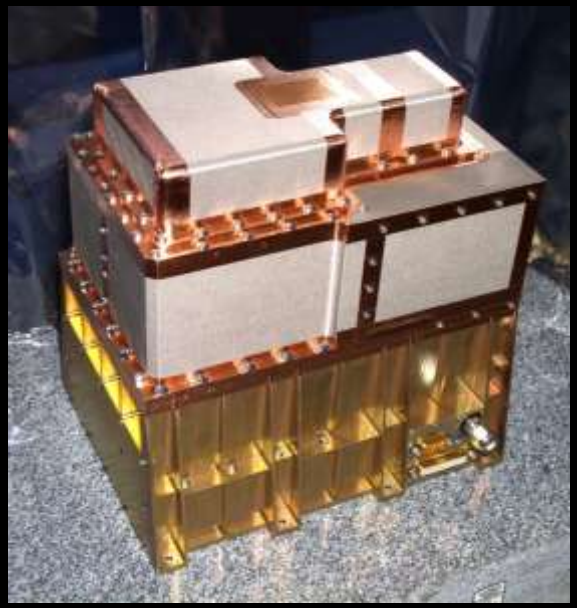


Orbital ATK built the Dawn spacecraft

Dawn Instruments

Camera

Provided and operated by the German Aerospace Agency and the Max Planck Institute for Solar System Research



Gamma Ray and Neutron Spectrometers

Provided by Los Alamos National Labs and operated by the Planetary Science Institute

Visible and Infrared Mapping Spectrometers

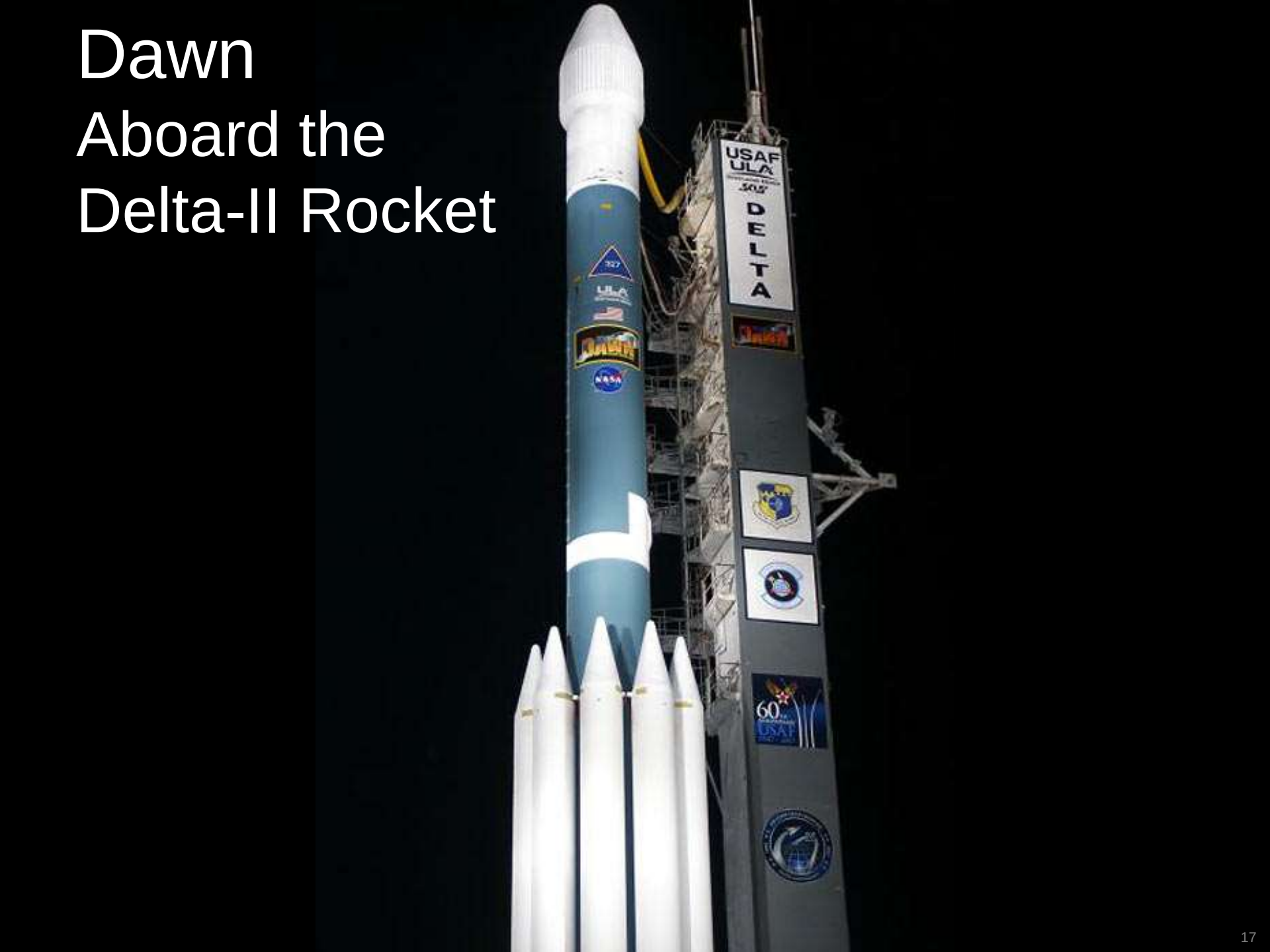
Provided by the Italian Space Agency and the Italian National Institute for Astrophysics, and operated by the Italian Institute for Space Astrophysics and Planetology

Dawn is Enabled by Ion Propulsion

Ion propulsion allows us to go places that would otherwise be extremely expensive or impossible within NASA's constraints

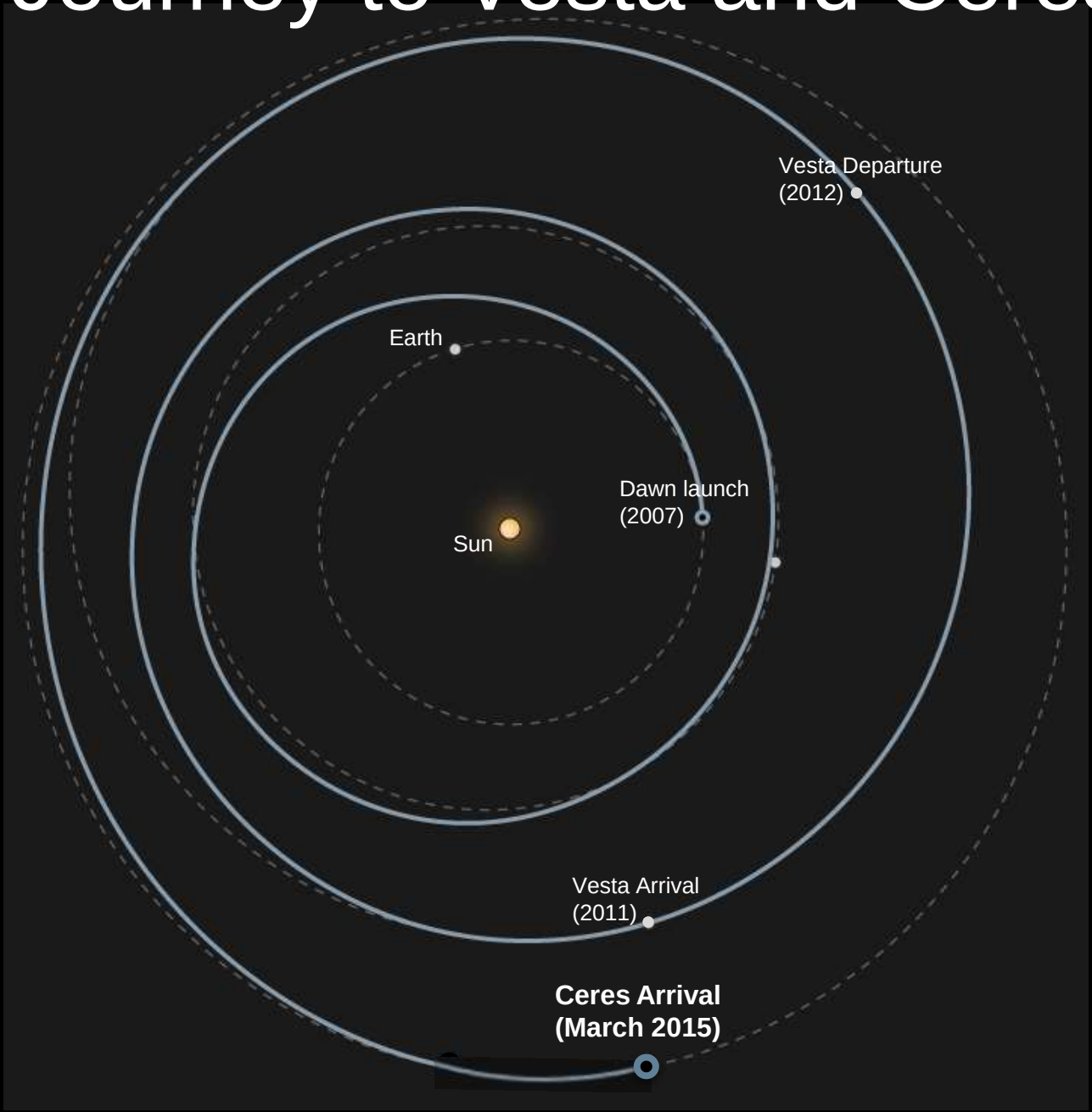
Dawn was the Largest Interplanetary Spacecraft that NASA has Launched

Dawn
Aboard the Delta-II Rocket



Dawn Launch – Sept 27, 2007

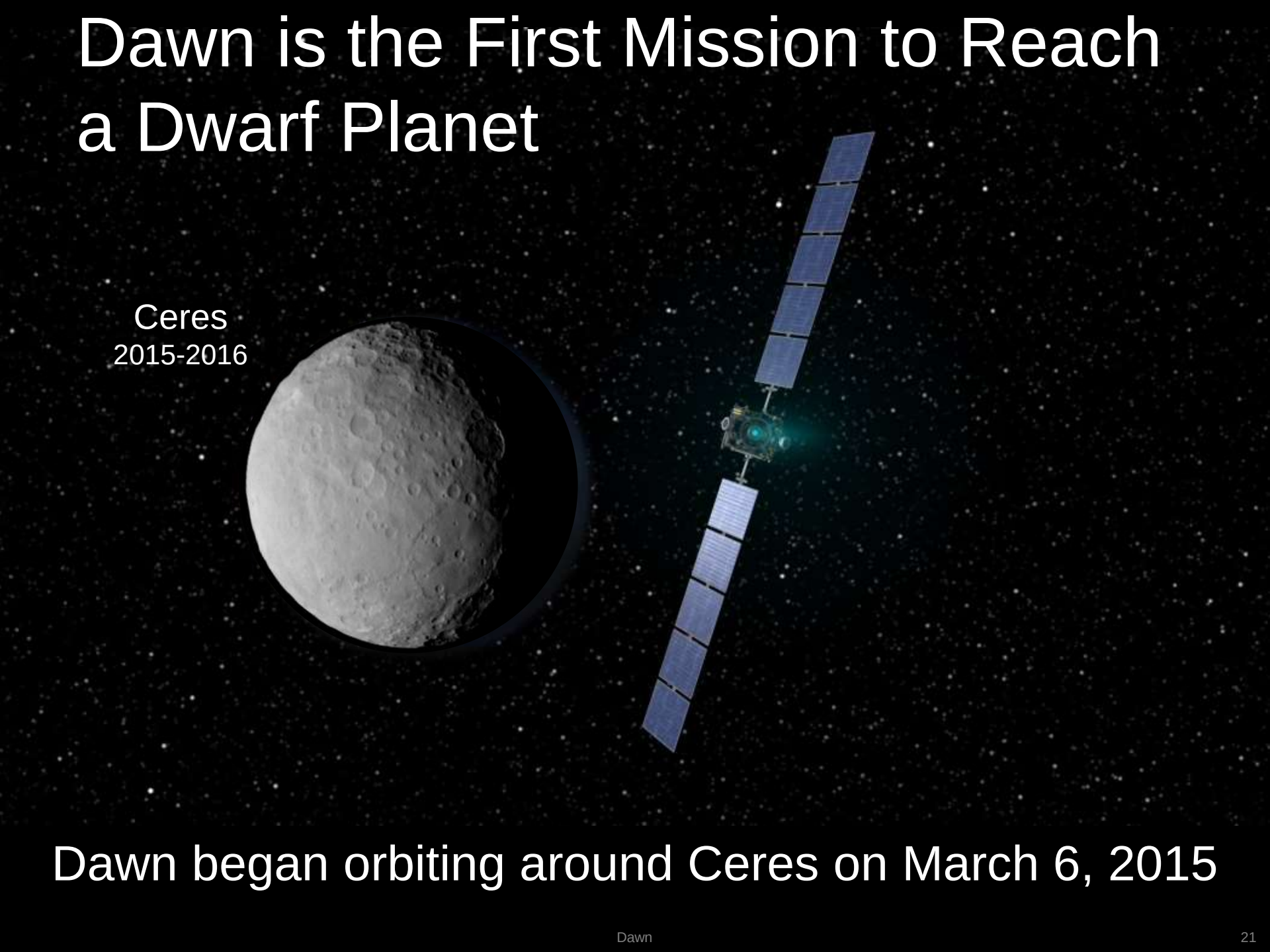
The Journey to Vesta and Ceres



Dawn is the First and Only Mission to Orbit a Main Belt Asteroid

Vesta
2011-2012

Dawn is the First Mission to Reach a Dwarf Planet



Dawn began orbiting around Ceres on March 6, 2015

CERES

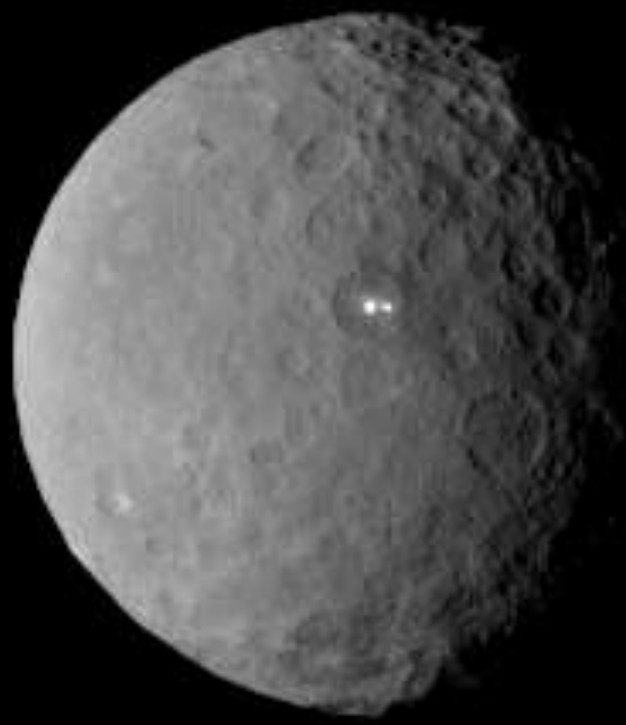
Dawn is Orbiting and Exploring Ceres in 2015-2016

Introduction to Ceres

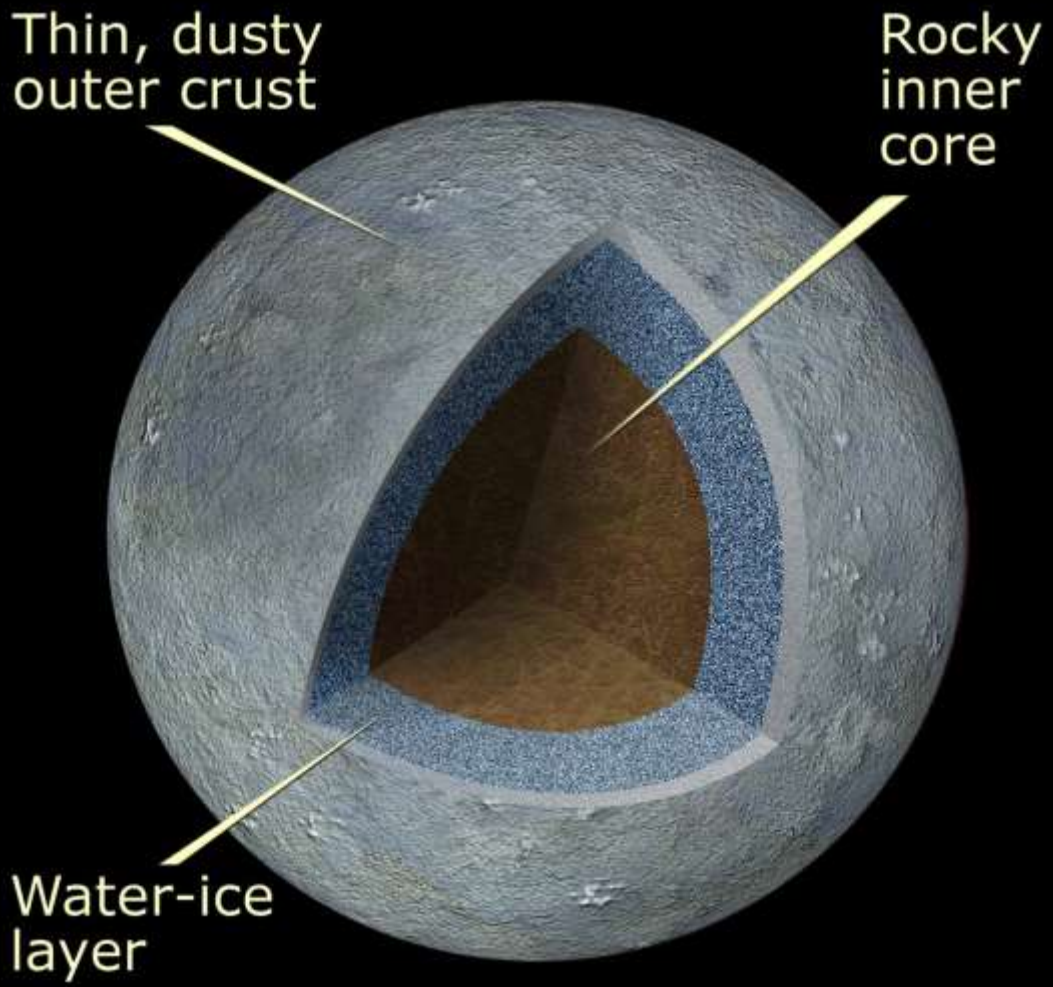
- The only dwarf planet in the inner solar system
- The largest, most massive body in the main asteroid belt
- Named after the Roman goddess of agriculture

Ceres - The Basics

- About 590 miles (950 km) in diameter
- Ceres is ~25% water, and had a liquid ocean in the past
- At present Ceres is a warm icy body that may still have some liquid water



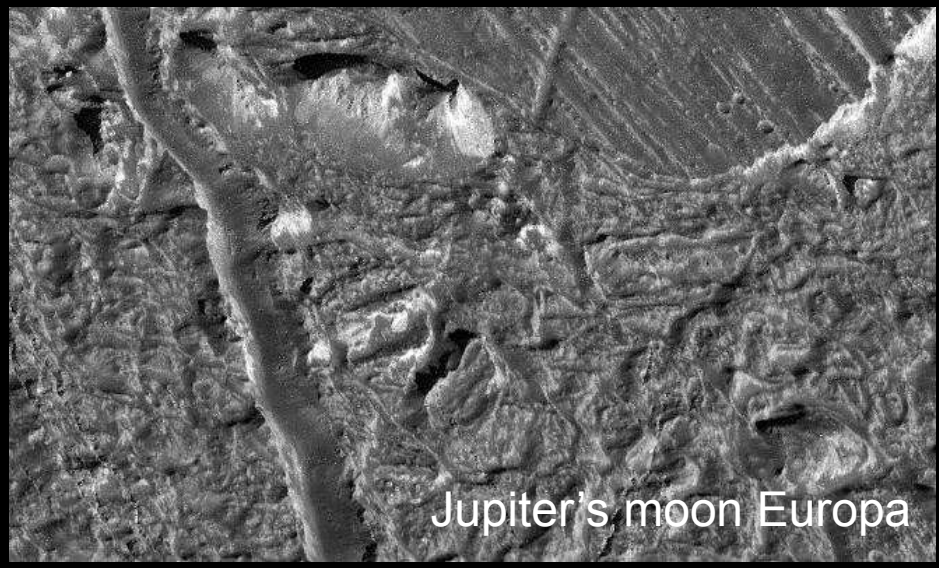
What We Expect

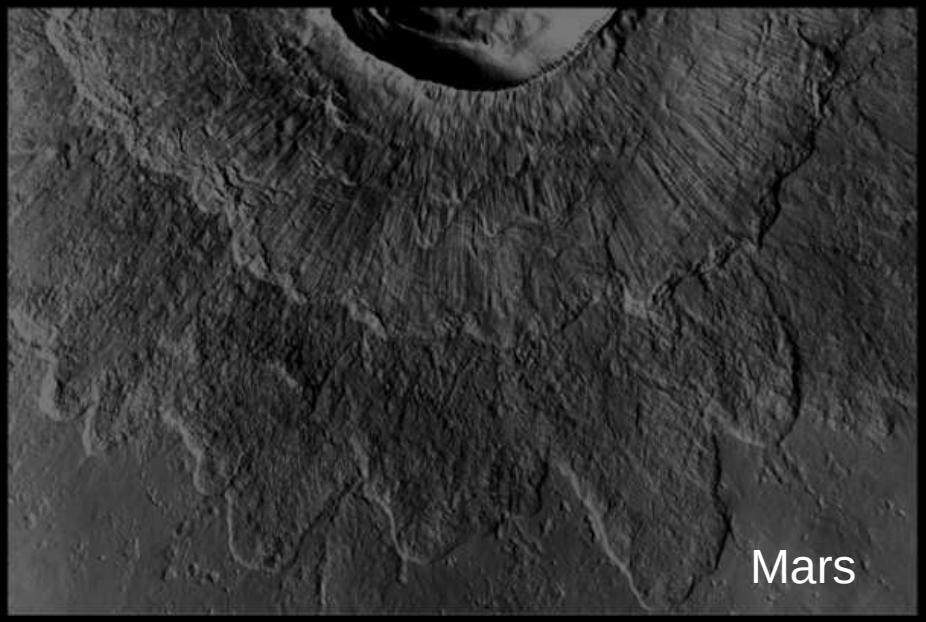


Dawn will map the surface properties, probe the interior structure, and characterize the interaction between them

What Might We Discover?

- Features caused by subsurface water
- Remnants of an ancient ocean
- Exotic surface composition


Jupiter's moon Europa


Mars


Deep Atlantic Ocean, Earth

For More Information

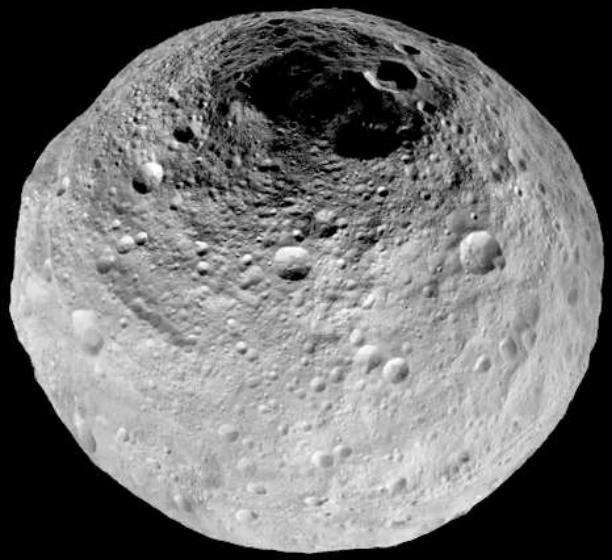
http://dawn.jpl.nasa.gov

http://solarsystem.nasa.gov

VESTA

Dawn Orbited and Explored Vesta in 2011-2012

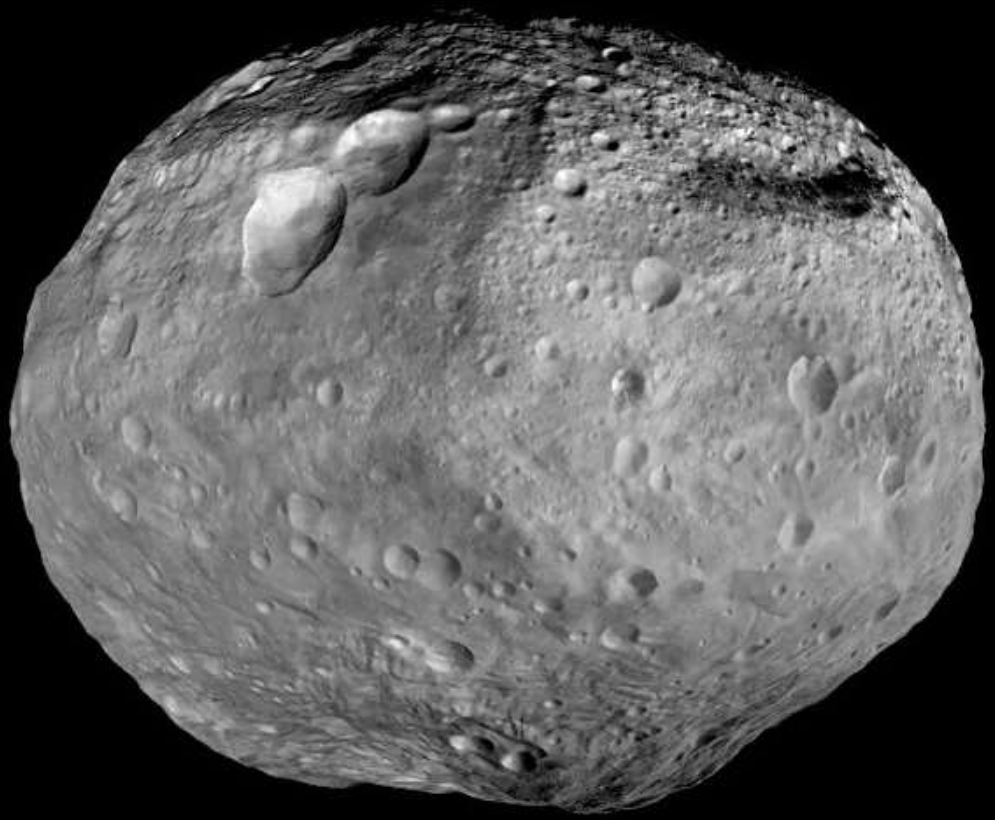
Vesta



NASA/JPL-Caltech/UCLA/MPS/DLR/IDA

Vesta Revealed

- The second most massive body in the main asteroid belt
- Named after the Roman goddess of hearth and home



Huge Impacts

Impacts Sent Pieces of Vesta to Earth

More Meteorites from Vesta than from the Moon and Mars Combined

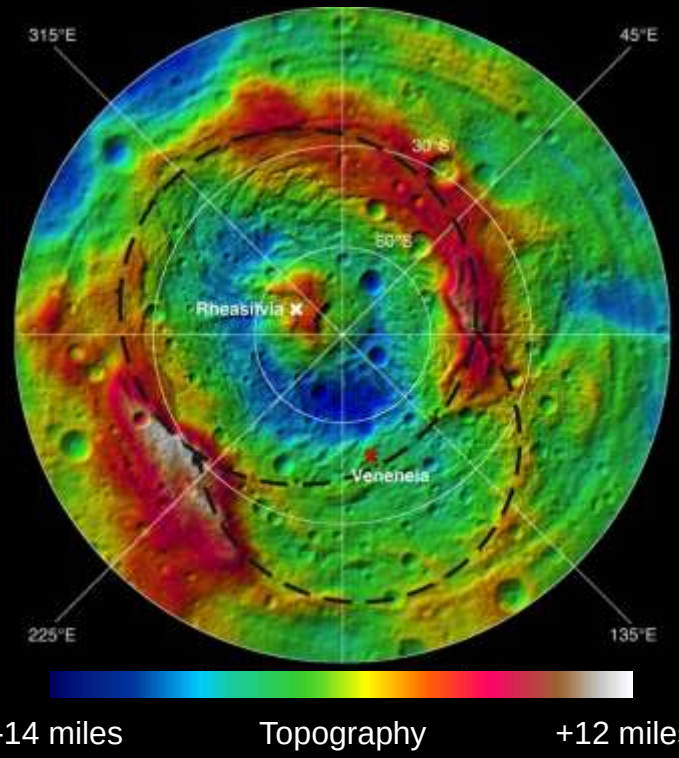
Remnants of the Impacts

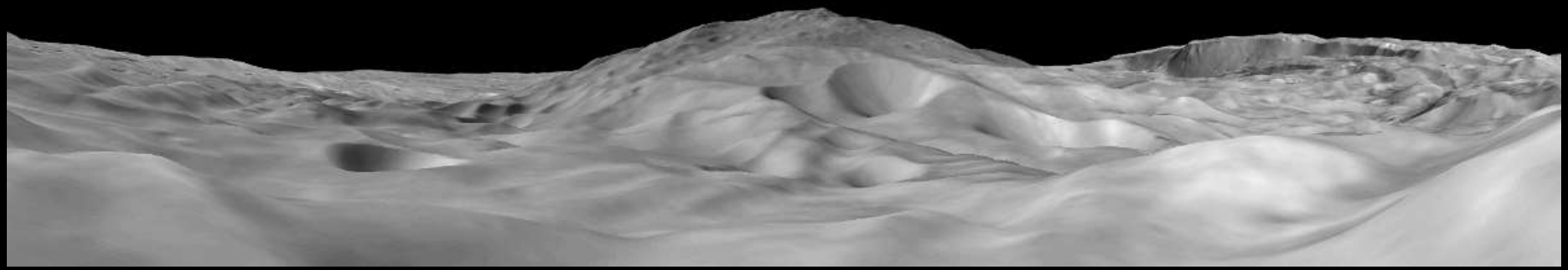
The massive impacts rippled through Vesta, leaving giant scars across the surface

Giant Impact Basins in the South

Rheasilvia is the largest crater (relative to body size) in the Solar System

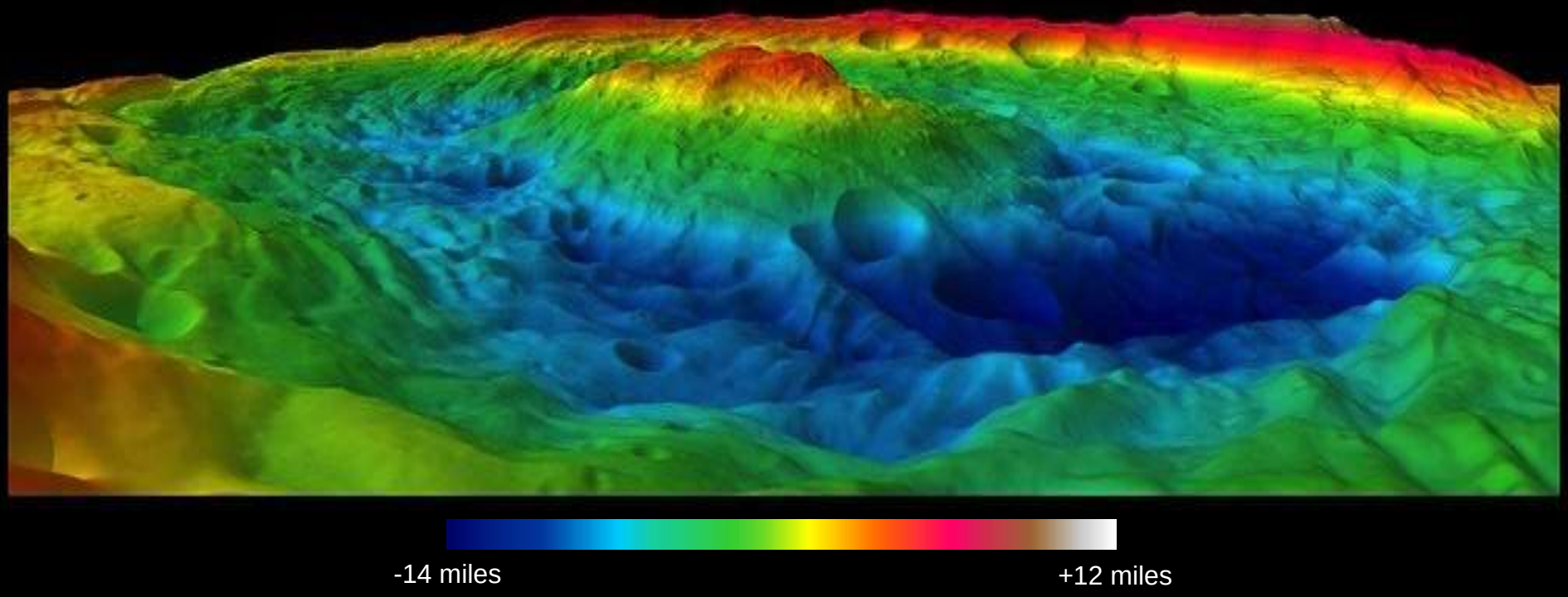
Scaled to Earth, it would stretch from Washington DC, over the North Pole, to Tokyo



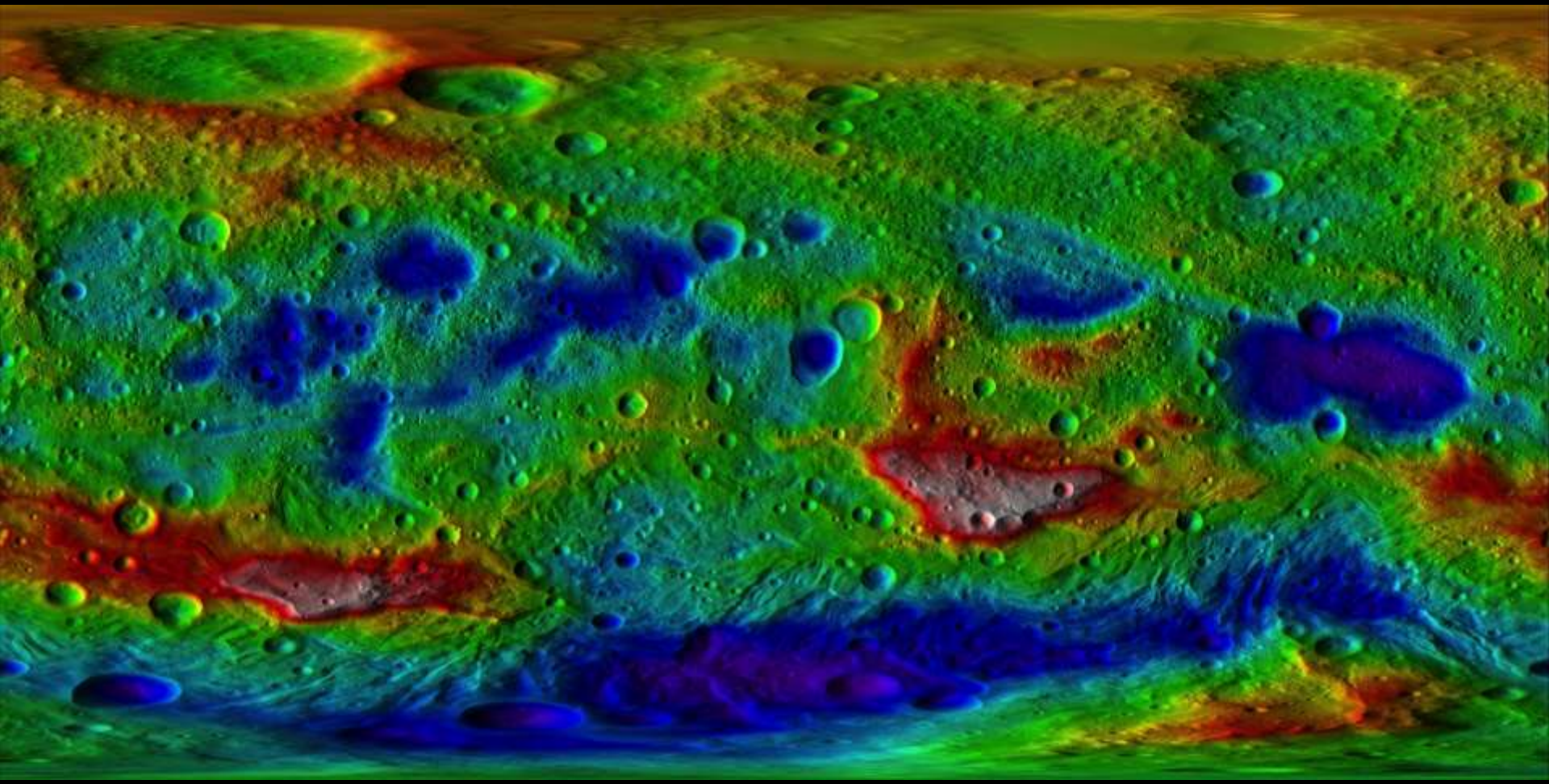


Largest Mountain

Rheasilvia's central peak is more than twice as high as Mt. Everest – rivaling Olympus Mons (on Mars) as the tallest mountain in the solar system



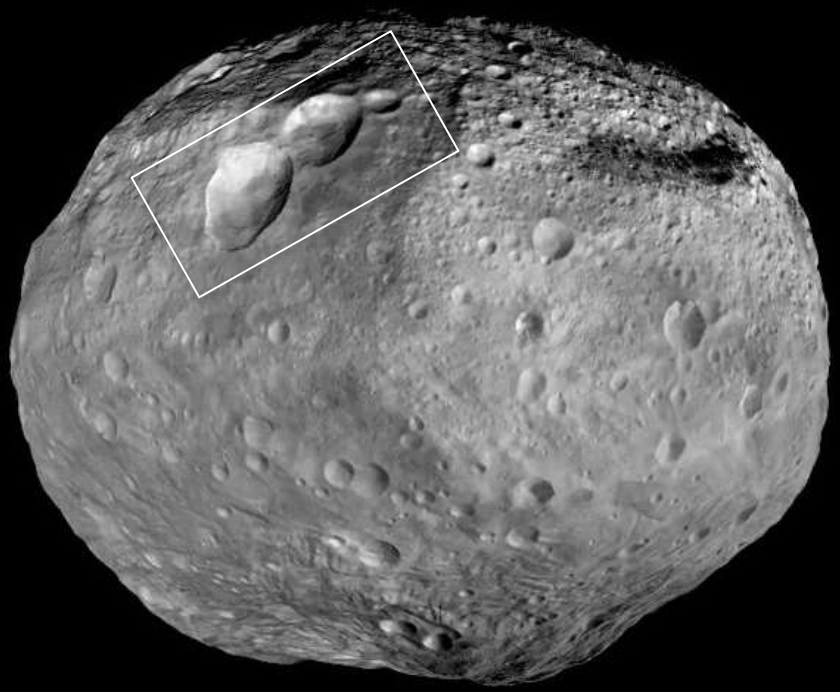
Rugged Topography



-14 miles

+12 miles

Vesta’s Snowman



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